

REMARKS

Claims 1-27 are pending in the application. Claims 6-19 and 21-24 are withdrawn from consideration. Claims 1-3, 20 and 25 are rejected. Claims 26 and 27 are objected to. Claims 4 and 5 are allowed.

Reconsideration and review of the claims on the merits are respectfully requested.

Allowable Subject Matter

Applicants appreciate the Examiner's indication that Claims 4-5 are allowed, and that Claims 26-27 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicants submit that based on the remarks provided below directed to the patentability of Claim 1, dependent Claims 26-27 should now be allowable, without amendment, and such is respectfully requested.

Claim Rejections - 35 U.S.C. § 112

Claim 25 is rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

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Claim 25 is rejected because the claim is drawn to a method for manufacturing a lithium secondary cell, but the method steps are only toward the forming of the anode. The Examiner indicates that the claim should instead be drawn to the method of making an anode and not to the battery.

In order to expedite prosecution of this application, without traversing the merits of the rejection, Applicants respond by amending Claim 25 to recite the manufacturing of an anode instead of a battery, as suggested by the Examiner.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. § 112, second paragraph.

Claim Rejections Under 35 U.S.C. § 102 and § 103

A. Claims 1-2 are rejected under 35 U.S.C. § 102(b) as assertedly being anticipated by Nakagiri et al. (JP 11-288706, machine translation) for the reasons given in the Office Action.

The Examiner cites Nakagiri et al. as teaching that a lithium foil was coated with LiF and LiCl, and that the negative electrode charge collector uses expanded metal made from nickel.

B. Claims 3 and 20 are rejected under 35 U.S.C. § 102(b) as assertedly being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Nakagiri et al. for the reasons given in the Office Action.

The Examiner states that in the event any differences can be shown for the product of the product by process Claim 3, as opposed to the product taught by Nakagiri et al., such differences would have been obvious to one of ordinary skill in the art as a routine modification of the product in the absence of a showing of unexpected results, and further states that the determination of patentability is based upon the product itself, not upon the method of its production.

Applicants respond as follows.

Nakagiri et al. does not anticipate or render obvious each and every requirement of at least Applicants' independent Claims 1 and 3. Nakagiri et al. does not disclose, teach or suggest, for example, "said anode...wherein said lithium layer has substantially no lithium hydroxide or lithium oxide film or the like on the surface thereof", or, for example, "said anode...wherein said lithium layer and said metal fluoride substance layer are formed by a vacuum film growth method".

Nakagiri et al. was disclosed in the present specification as being inferior technology, distinguishable from the present invention. In the specification at the bridging paragraph of pages 4-5, Applicants describe the Japanese Un-Examined Patent Publication No. 11-288706, as disclosing a past improvement in the cycle life of a battery, by forming a surface covering film having as a main component a rock-salt type crystal structure, on the surface of a lithium sheet oriented with preference to a uniform crystal structure, thereby enabling suppressing a dendrite precipitation reaction of the metallic lithium. This disclosure mentions that it is preferable that the substance used as a surface covering film be selected as at least one lithium halide, selected

from among LiCl, LiBr, and LiI. In this case, in order to form a solid solution covering film of at least one of LiCl, LiBr, and LiI and LiF, a lithium sheet formed by pressuring (cold rolling) and oriented preferably on the crystal plane is immersed in a dielectric fluid containing at least one of a sodium molecule or sodium ion, a bromine molecule or bromine ion, and an iodine molecule or iodine ion with a fluoride molecule or fluoride ion. This technology makes use of a cold-rolled lithium sheet, and because it is easy to expose the lithium sheet to the atmosphere, there is a tendency for a covering film to be formed on the surface due to water content and the like, leading to non-uniformity in the activated points, making it impossible to achieve the intended stable covering film and causing insufficient suppression of dendrite growth.

Additionally, because of the immersion into an electrolytic fluid, the same problems arise as noted with regard to the Japanese Un-Examined Patent Publication No. 7-302617, cited on pages 2-3 of the present specification. Because of the use of a cold-rolled lithium sheet, compared with the case of using an amorphous lithium layer, there is a greater tendency toward dendrite formation, leading to possible insufficient cycle life.

The present invention is distinguished from the structure of Nagakiri's faulty process. In the present invention, there is no lithium hydroxide or lithium oxide film or the like on the surface thereof, as occurred in the past. Additionally, because a metal fluoride layer is formed on the lithium layer without losing the vacuum condition, good amorphous properties are achieved, and an anode is obtained which has covering film made of a metal fluoride. (See page 10, lines 13-21 and Comparison Example 2, where a lithium layer was cold-rolled, page 29)

The present inventions provide solutions for the problems described above in a lithium secondary cell with an anode having a lithium layer containing a film of metallic lithium or alloy thereof, formed by a vacuum film growth method (Claim 3) or having substantially no lithium hydroxide or lithium oxide film or the like on the surface (Claim 1), where the anode contains therein a metal fluoride layer comprising at least one metal fluoride substance. These lithium secondary cells feature suppressed dendrite growth in an anode, which contains a metallic lithium or an alloy thereof, and feature superior energy density, superior electromotive force, and superior cycle life.

Claims 2, 20 and 26-27 depend upon independent Claim 1 and are patentable for at least the same reasons as given for the patentability of Claim 1 above.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. §102(b) and 35 U.S.C. § 103(a). Allowance of all pending, but not withdrawn, claims is earnestly requested.

Conclusion

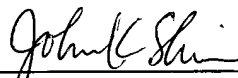
In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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Respectfully submitted,



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